User Manual

Tektronix

TDS 820
Digitizing Oscilloscope

070-8512-02

Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B010000	Tektronix, Inc., Beaverton, Oregon, USA
E200000	Tektronix United Kingdom, Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands

Instruments manufactured for Tektronix by external vendors outside the United States are assigned a two digit alpha code to identify the country of manufacture (e.g., JP for Japan, HK for Hong Kong, IL for Israel, etc.).

Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

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EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73A
8444 AB Heerenveen
The Netherlands

declare under sole responsibility that the

TDS 820 Digitizing Oscilloscope

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 55011 Class A Radiated and Conducted Emissions

EN 50081-1 Emissions:

EN 60555-2 AC Power Line Harmonic Emissions

EN 50082-1 Immunity:

IEC 801-2 Electrostatic Discharge Immunity
IEC 801-3 RF Electromagnetic Field Immunity
IEC 801-4 Electrical Fast Transient/Burst Immunity
IEC 801-5 Power Line Surge Immunity

Safety

Please take a moment to review these safety precautions. They are provided for your protection and to prevent damage to the digitizing oscilloscope. This safety information applies to all operators and service personnel.

Symbols and Terms

These two terms appear in manuals:

- CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.
- WARNING statements identify conditions or practices that could result in personal injury or loss of life.

These two terms appear on equipment:

- *CAUTION* indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.
- *DANGER* indicates a personal injury hazard immediately accessible as one reads the marking.

This symbol appears in manuals:

Static-Sensitive Devices

These symbols appear on equipment:

DANGER
High Voltage

Protective
ground (earth)
terminal

ATTENTION
Refer to
manual

Specific Precautions

Observe all of these precautions to ensure your personal safety and to prevent damage to either the digitizing oscilloscope or equipment connected to it.

Power Source

The digitizing oscilloscope is intended to operate from a power source that will not apply more than 250 V rms between the supply conductors or between either supply conductor and ground. A protective ground connection, through the grounding conductor in the power cord, is essential for safe system operation.

Grounding the Digitizing Oscilloscope

The digitizing oscilloscope is grounded through the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle where earth ground has been verified by a qualified service person. Do this before making connections to the input or output terminals of the digitizing oscilloscope.

Without the protective ground connection, all parts of the digitizing oscilloscope are potential shock hazards. This includes knobs and controls that may appear to be insulators.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, matched by type, voltage rating, and current rating.

Do Not Remove Covers or Panels

To avoid personal injury, do not operate the digitizing oscilloscope without the panels or covers.

Take Antistatic Precautions

Wear an antistatic grounding wrist strap when working with the input connectors on the digitizing oscilloscope.

Electric Overload

Never apply to a connector on the digitizing oscilloscope a voltage that is outside the range specified for that connector.

Do Not Operate in Explosive Atmospheres

The digitizing oscilloscope provides no explosion protection from static discharges or arcing components. Do not operate the digitizing oscilloscope in an atmosphere of explosive gases.

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Preface

This is the User Manual for the TDS 820 Digitizing Oscilloscope.

The *Getting Started* section familiarizes you with the operation of your digitizing oscilloscope.

Operating Basics covers basic principles of the operation of the oscilloscope. These articles help you understand why your instrument works the way it does.

The *Reference* section teaches you how to perform specific tasks. See page 3-1 for a complete list of tasks covered in that section.

The *Appendices* provide an option and accessories listing, product specifications, and other useful information.

Related Manuals

The following documents are related to the use or service of the digitizing oscilloscope.

- The *TDS 820 Programmer Manual* describes using a computer to control the digitizing oscilloscope through the GPIB interface.
- The *TDS TDS 820 Reference* gives you a quick overview of how to operate your digitizing oscilloscope.
- The TDS 820 *Service Manual* provides information for maintaining and servicing your digitizing oscilloscope.

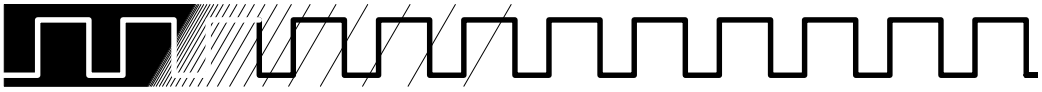
Conventions

In the *Getting Started* and *Reference* sections, you will find various procedures which contain steps of instructions for you to perform. To keep those instructions clear and consistent, this manual uses the following conventions:

- Names of front panel controls and menu labels appear in boldface print.
- Names also appear in the same case (initial capitals, all uppercase, etc.) in the manual as is used on the oscilloscope front panel and menus. Front panel names are all upper case letters, for example, **VERTICAL MENU**, **CH 1**, etc.
- Instruction steps are numbered. The number is omitted if there is only one step.
- When steps require that you make a sequence of selections using front panel controls and menu buttons, an arrow (→) marks each transition between a front panel button and a menu, or between menus. Also, when a name is a main menu or side menu item it is clearly indicated: Press **VERTICAL MENU → Offset** (main) **→ Set to 0 V** (side) **→ Position** (main) **→ Set to 0 V** (side).

  Using the convention just described results in instructions that are graphically intuitive and simplifies procedures. For example, the instruction just given replaces these five steps:

  1. Press the front panel button **VERTICAL MENU**.
  2. Press the main menu button **Offset**.
  3. Press the side-menu button **Set to 0 V**.
  4. Press the main menu button **Position**
  5. Press the side menu button **Set to 0 divs**
- Sometimes you may have to make a selection from a popup menu: Press **SHIFT → UTILITY → System** (main) **→ Config** (popup). In this example, you repeatedly press the main menu button **System** until **Config** is highlighted in the pop-up menu.



Overview

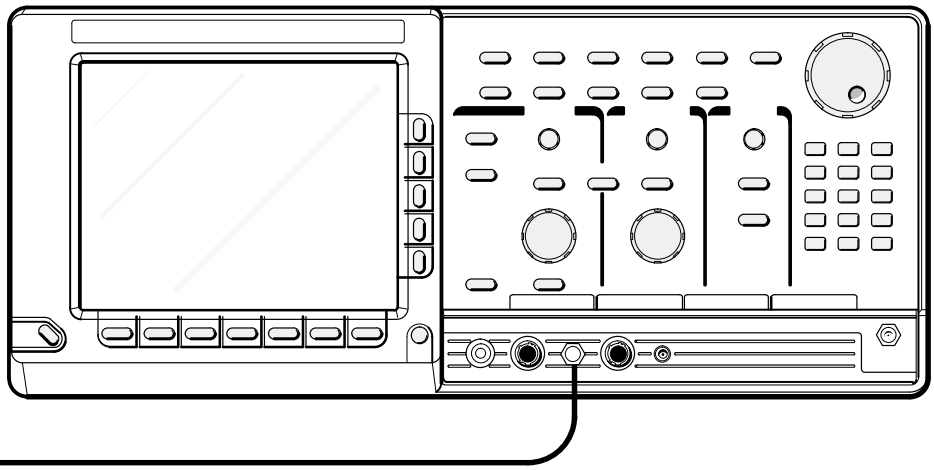
Overview

This section presents a product description, start up information, and four examples discussing the digitizing oscilloscope's basic functions. Use the *At a Glance* section (starting on page 2-3) to help you locate the correct knobs, buttons, and menus.

- *Example 1* teaches you how to reset the digitizing oscilloscope, use the autoset function, and display and adjust waveforms.
- *Example 2* explains how to add, control, and delete multiple waveforms.
- *Example 3* introduces you to the automated measurement system.
- *Example 4* discusses saving and recalling the digitizing oscilloscope's setups.

If you do not perform the examples, use the *Operating Basics* and *Reference* sections to learn about the digitizing oscilloscope's front panel and menu arrangement and specific functions.

Product Description



Your Tektronix TDS 800 Digitizing Oscilloscope is a superb tool for acquiring, displaying, and measuring waveforms. Its performance addresses the needs of both benchtop lab and portable applications with:

- 8 GHz maximum repetitive analog bandwidth in TDS 820 Option 1D; 6 GHz in the standard TDS 820.
- Pretrigger view (not available with Option 1D).
- Acquisition channels—The TDS 820 has two. You may use and display all channels simultaneously.
- Two14-bit digitizers.
- Up to 15,000-point record length per channel.
- Waveform Math—Invert a single waveform and add, subtract, and multiply two waveforms. On option 2F equipped instruments, integrate or differentiate a single waveform or perform an FFT (fast fourier transform) on a waveform to display its frequency spectra.
- Full GPIB software programmability. GPIB hardcopy output. On instruments equipped with option 13, hardcopy output using the RS-232 or Centronics ports.
- Complete measurement and documentation ability.
- Intuitive graphical icon operation blended with the familiarity of traditional horizontal and vertical knobs.
- On-line help at the touch of a button.

The *Appendices* list the options and accessories and the product specifications.

Start Up

Before you use the digitizing oscilloscope, ensure that it is properly installed and powered on.

Operation

To properly install and power on the digitizing oscilloscope, do the following:

Installation

1. Be sure you have the appropriate operating environment. Specifications for temperature, relative humidity, altitude, vibrations, and emissions are included in *Appendix B: Specification* at the rear of this manual.
2. Leave space for cooling. Do this by verifying that the air intake and exhaust holes on the sides of the cabinet (where the fan operates) are free of any airflow obstructions. Leave at least 2 inches (5.1 cm) free on each side.

WARNING

To avoid electrical shock, be sure that the power cord is disconnected before checking the fuse.

3. Check the fuse to be sure it is the proper type and rating (Figure 1-1). You can use either of two fuses. Each fuse requires its own cap (see Table 1-1). The digitizing oscilloscope is shipped with the UL approved fuse installed.
4. Check that you have the proper electrical connections. The digitizing oscilloscope requires 90 to 250 VAC rms, continuous range, 47 Hz to 63 Hz, and may require up to 300 W.
5. Connect the proper power cord from the rear-panel power connector (Figure 1-1) to the power system.

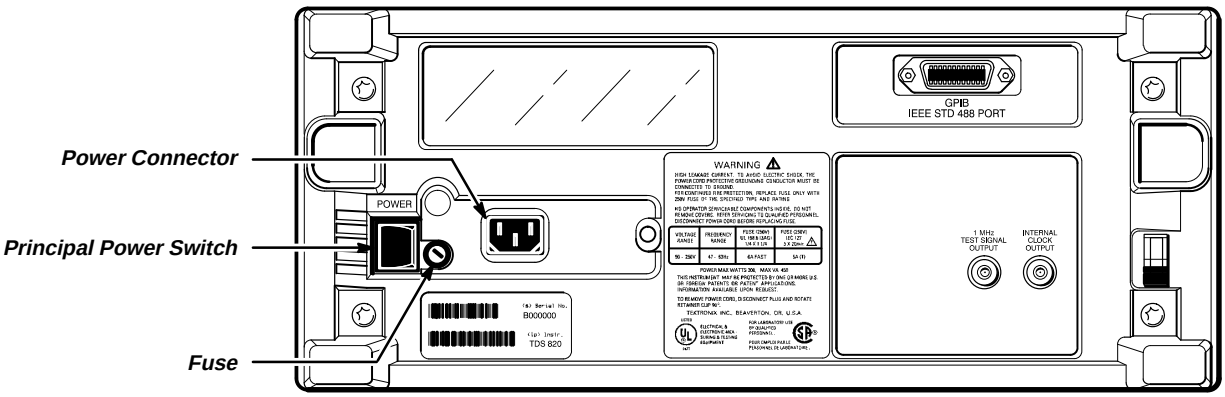


Figure 1-1: Rear Panel Controls Used in Start Up

Table 1-1: Fuse and Fuse Cap Part Numbers

Fuse	Fuse Part Number	Fuse Cap Part Number
.25 inch × 1.25 inch (UL 198.6, 3AG): 6 A FAST, 250 V.	159–0013–00	200–2264–00
5 mm × 20 mm (IEC 127): 5 A (T), 250 V.	159–0210–00	200–2265–00

Power On

1. Check that the rear-panel principal power switch is on (Figure 1-1). The principal power switch controls all AC power to the instrument.
2. If the oscilloscope is not powered on (the screen is blank), push the front-panel **ON/STBY** button to toggle it on (Figure 1-2).

   The **ON/STBY** button controls power to most of the instrument circuits. Power continues to go to certain parts even when this switch is set to STBY.

   Once the digitizing oscilloscope is installed, it is typical to leave the principal power switch on and use the **ON/STBY** button as the power switch.

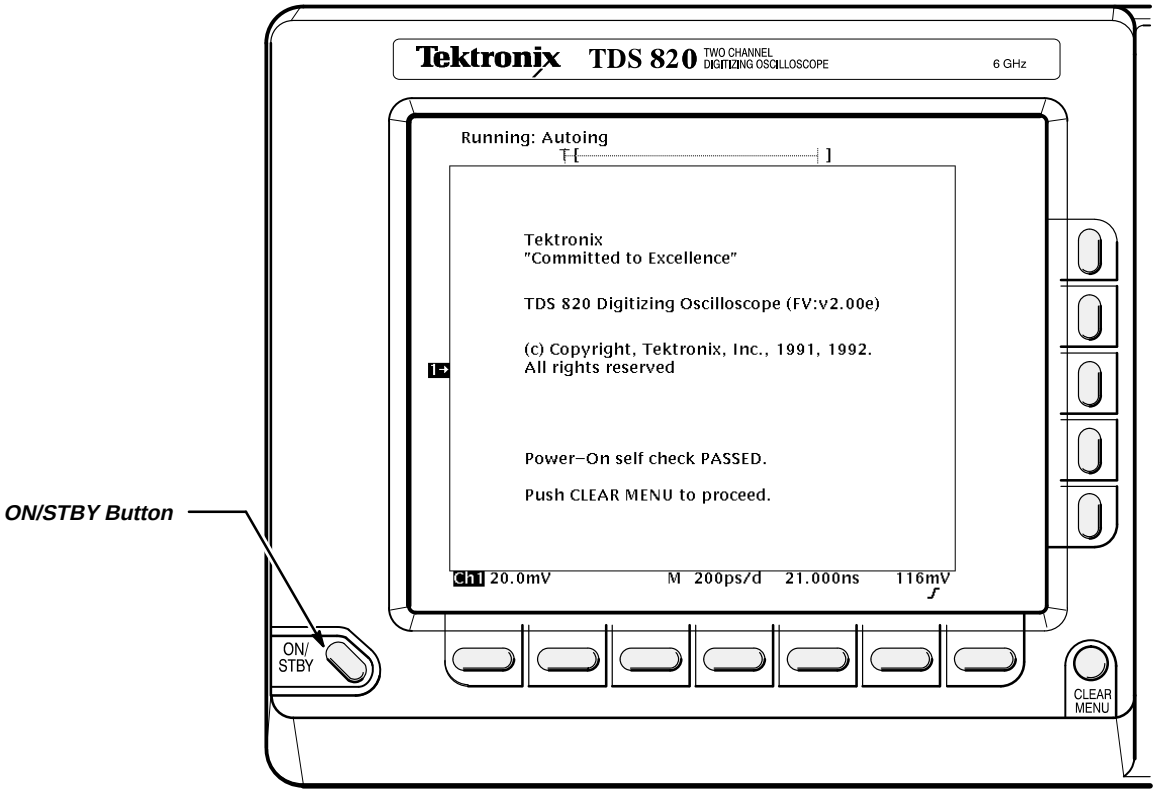


Figure 1-2: ON/STBY Button

Self Test

Check the self test results. The digitizing oscilloscope automatically performs power-up tests each time it is turned on. It will come up with a display screen that states whether or not it passed self test. (If the self test passes, the status display screen will be removed after a few seconds.)

If the self test fails, call your local Tektronix Service Center. Depending on the type of failure, you may still be able to use the oscilloscope before it is serviced.

Power Off

Toggle the **ON/STBY** switch to turn off the oscilloscope.

Setting Up for the Examples

All the examples use the same setup. Once you perform this setup, you do not have to change the signal connections for any of the other examples.

When you finish, the setup should appear as shown in Figure 1-3.

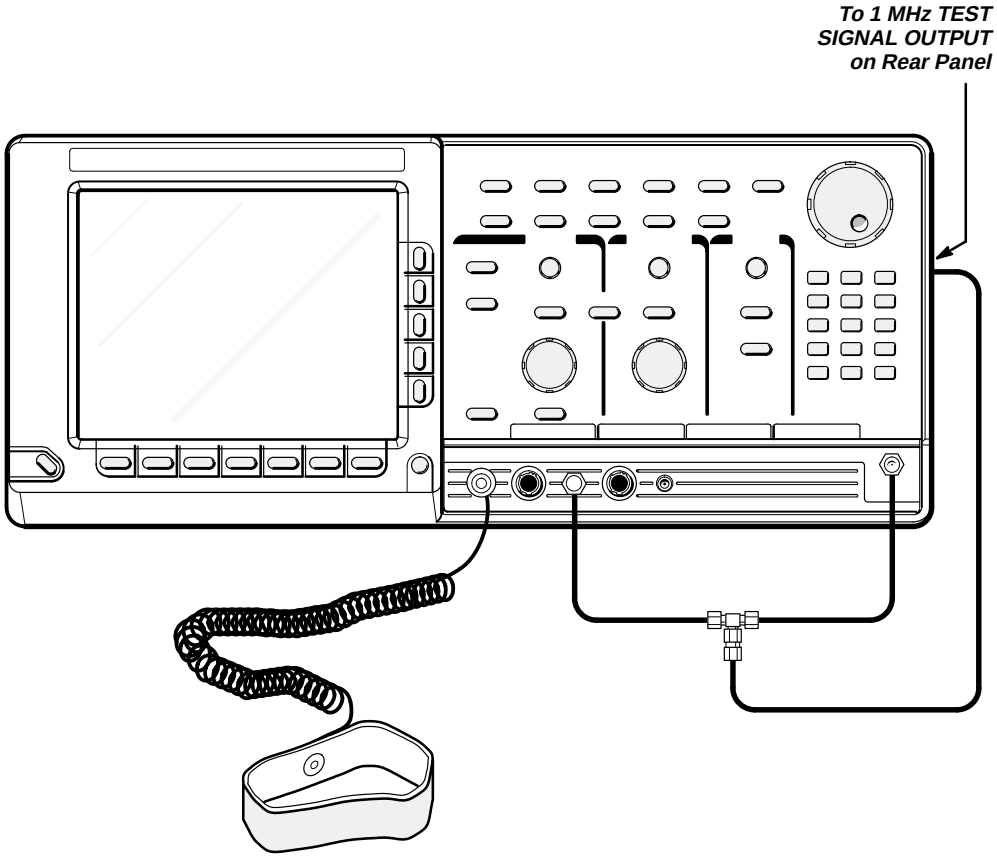


Figure 1-3: The Example Setup

1. Put on the antistatic grounding wrist strap provided.

CAUTION

Be sure to wear the antistatic wrist strap when making connections to the front panel. The front panel input connectors are highly susceptible to damage from electrostatic discharge.

2. Remove all probes, cables, short-circuit terminations, and signal inputs from the input SMA connectors along the lower part of the front panel.
3. Connect the long SMA cable supplied with the digitizing oscilloscope to the **1 MHz TEST SIGNAL OUTPUT** connector on the rear panel.
4. Connect the front panel **CH 1** SMA connector to one of the two short SMA cables supplied with the digitizing oscilloscope.
5. Connect the front panel external **TRIGGER INPUT** SMA connector to the other short SMA cable supplied with the digitizing oscilloscope.
6. Connect the SMA female-to-female adapter to the male connection in the center of the SMA T supplied with the digitizing oscilloscope.
7. Connect the other end of the SMA cable attached to **CH 1** to one end of the SMA T.
8. Connect the other end of the SMA cable attached to the external **TRIGGER INPUT** to the other end of the SMA T.

NOTE

Splitting the signal using the SMA T does not preserve the 50 Ω environment. As a result, you will see aberrations of the signal due to this impedance mismatch. The aberrations are of no consequence for the examples. However, to obtain accurate measurements, be sure you split signals using a 50 Ω power divider to match the impedance of the test setup.

9. Connect the other end of the long cable attached to the rear panel **1 MHz TEST SIGNAL OUTPUT** connector to the SMA female-to-female adapter.

CAUTION

To prevent damage to the inputs do not attempt to measure any signals greater than 3 V peak–to–peak with the TDS 820 with Option 1D (6 V peak-to-peak with the standard TDS 820).

Example 1: Displaying a Waveform

In this first example you learn about resetting the digitizing oscilloscope, using the autoset function, and displaying and adjusting a waveform.

Resetting the Digitizing Oscilloscope

All examples begin by resetting the digitizing oscilloscope to a known, factory default state. That is useful when you begin a new task and need to "start fresh" with known default settings.

1. Press the save/recall **SETUP** button to display the Setup menu (Figure 1-4).

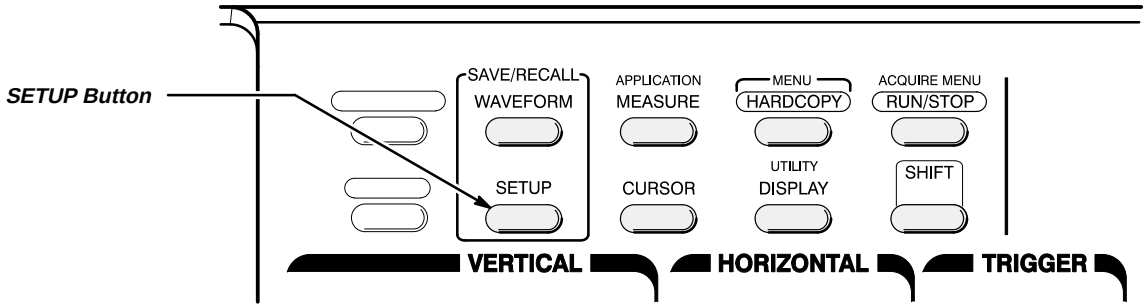


Figure 1-4: Menu Button Locations (Gray Buttons)

The digitizing oscilloscope displays main menus along the bottom of the screen. Figure 1-5 shows the Setup main menu.

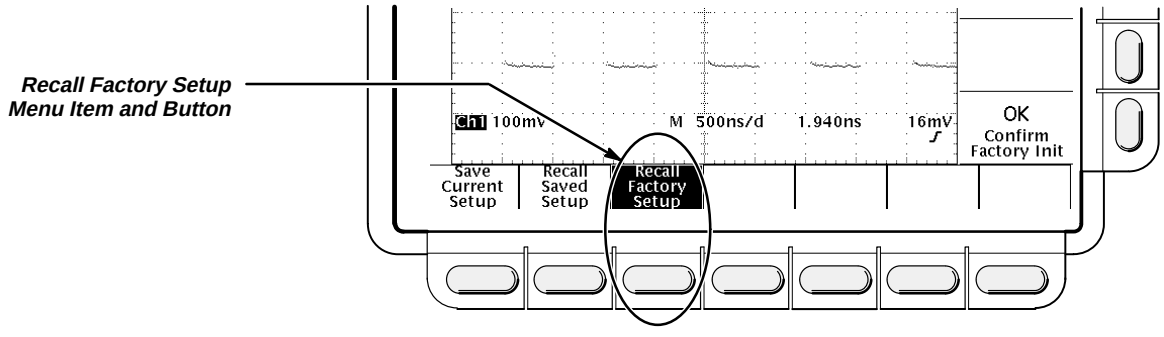


Figure 1-5: The Displayed Setup Menu

To select menu items from a displayed main menu, you press the button below the desired menu item. For example, the third menu item from the left is **Recall Factory Setup**, which is the default factory setup that you what for this example.

2. Press the button directly below the **Recall Factory Setup** menu item.

   The display shows side menus along the right side of the screen. The buttons to select these side menu items are to the right of the screen.

   Because an accidental instrument reset could destroy a setup that took a long time to create, the digitizing oscilloscope asks you to verify the **Recall Factory Setup** main menu selection (see Figure 1-6).

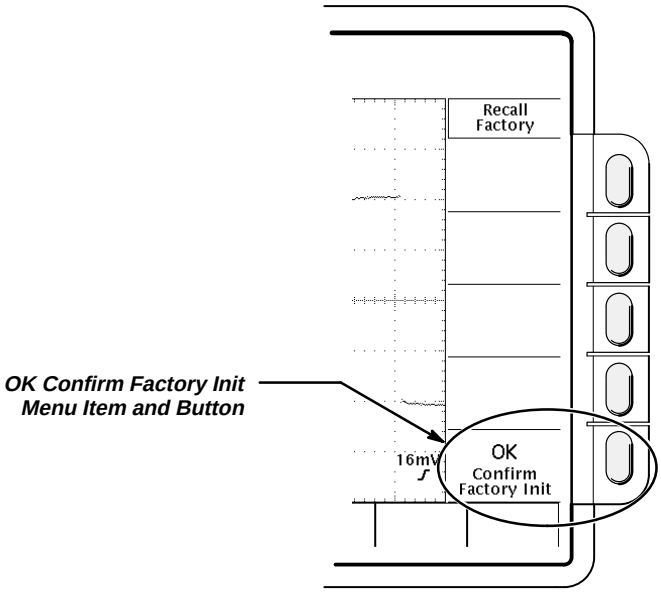


Figure 1-6: The Recall Factory Side Menu

3. Press the button to the right of the **OK Confirm Factory Init** side menu item.

NOTE

This manual uses the following notation to represent the sequence of selections you made in steps 1, 2 and 3: Press save/recall **SET-UP → Recall Factory Setup** (main) **→ OK Confirm Factory Init** (side).

Using Autoset

When you first connect a signal to a channel and display it, the signal displayed may not be usable. Use the digitizing oscilloscope's autoset function when that happens and you will quickly get a meaningful display.

For example, the factory default settings are useful for many of the signals you will be viewing with your digitizing oscilloscope. However, they are not appropriate for the rear panel test signal output. You therefore do not have a particularly usable display.

Now use the **AUTOSET** button to quickly get a clear, stable display.

1. Press the **AUTOSET** button (see Figure 1-7) and observe the stable waveform display.

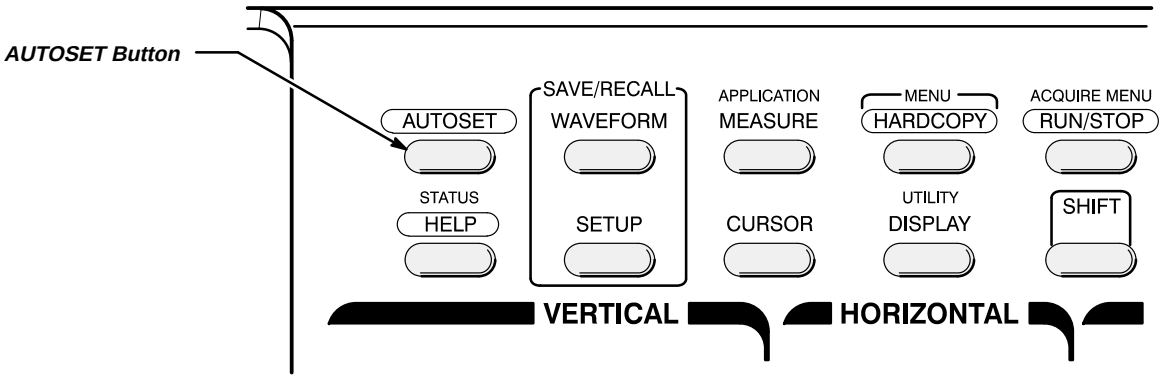


Figure 1-7: AUTOSET Button Location

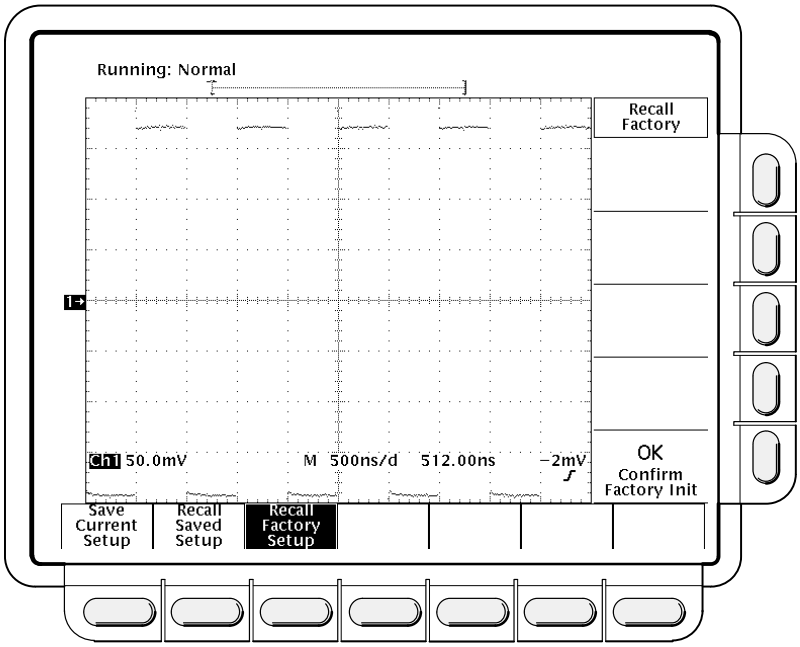


Figure 1-8: The Display After Pressing Factory Initialization and Autoset

Figure 1-8 shows the display after pressing **AUTOSET** for an instrument with delay lines.

NOTE

If you have an instrument without delay lines (TDS 820 Option 1D), your display may appear slightly different, but the following steps will still function as described.

2. To remove a menu from the display, press the **CLEAR MENU** button below the side menu buttons.

Display Elements

There are several important points to observe about the digitizing oscilloscope display:

- The channel reference indicator shows the vertical position of channel 1 ground when offset is to 0 V. (Otherwise, it shows ground plus offset.)
- The trigger readout shows that the digitizing oscilloscope is triggering on a rising edge. It also indicates the trigger level.
- The time base position readout shows the value of the main time base position (the time from the trigger to the first sample).

- The time base readout shows that the time base is showing a horizontal scale of 500 ns/div. The “M” indicates that it is the main time base. A “D” indicates a delayed time base.
- The channel readout indicates that channel 1 (**Ch1**) is selected. Its vertical scale is also displayed. The digitizing oscilloscope always displays channel 1 at reset.

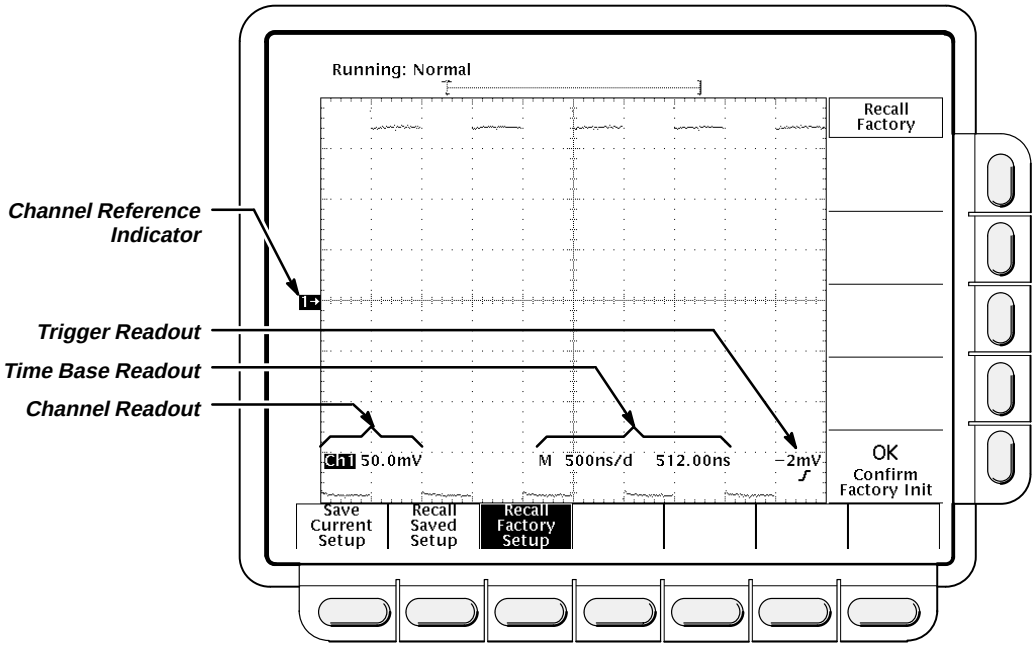


Figure 1-9: Display Elements

When a menu is displayed, the channel, time base, and trigger readouts appear in the graticule area. After you press the **CLEAR MENU** button, the readouts move below the graticule.

Adjusting the Display

After factory initialization, the display is in dots mode. You can adjust various display parameters using the **DISPLAY** button, which brings up the display menu (Figure 1-10).

1. Press the **DISPLAY** button.

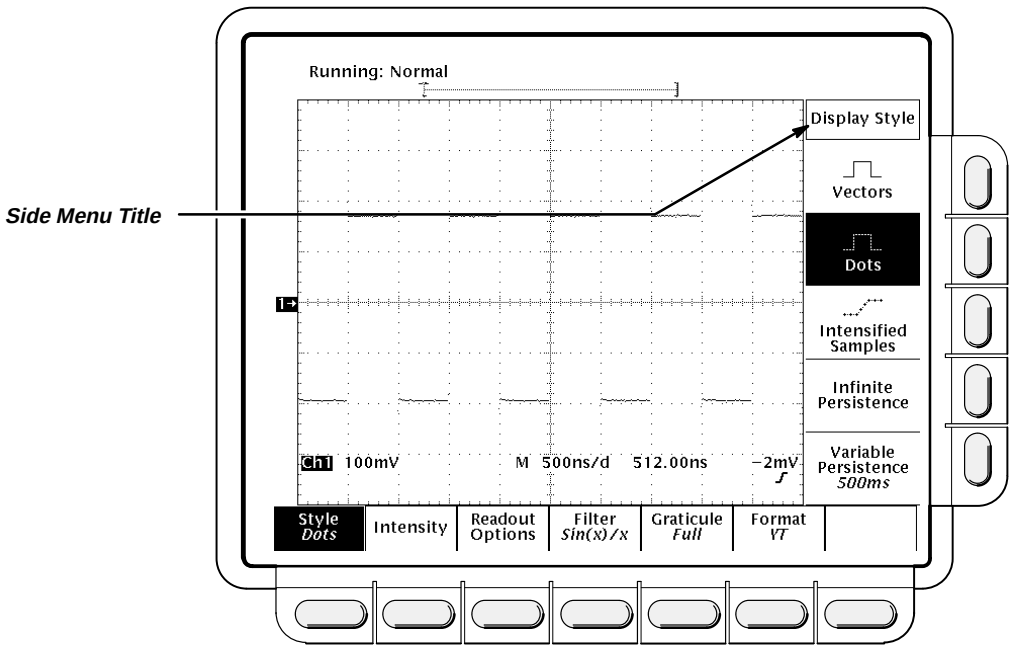


Figure 1-10: The Display Main Menu and Style Side Menu

Each menu item in the Display menu shows a side menu. Right now, the **Style** item in the main menu is highlighted, which means that the side menu shows the style choices. (If it is not, press the **Style** menu button to display them.)

2. Press the **Vectors** button on the side menu. Observe that the display switches from dots (the factory default setting) to vectors.

Adjusting the Waveform Display

The display shows the rear panel test signal. It is a 1 MHz square wave of approximately 300 mV amplitude. To adjust the size and placement of the waveform use the front-panel knobs.

Figure 1-11 shows the main **VERTICAL** and **HORIZONTAL** sections of the front panel. Each section has **SCALE** and **POSITION** knobs.

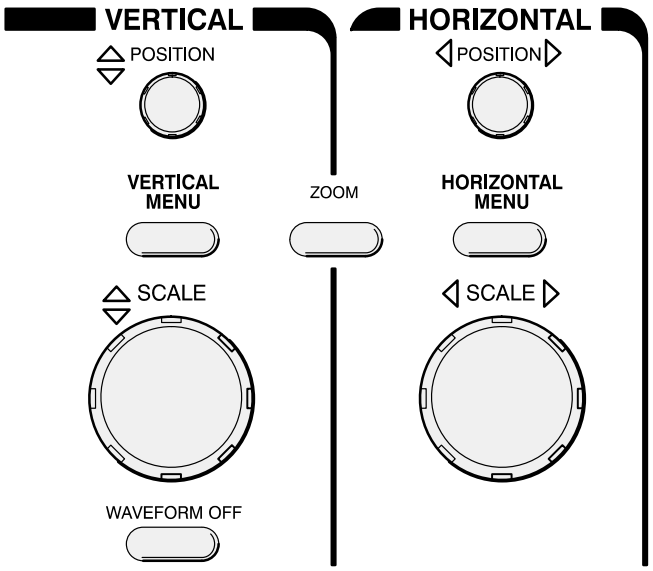


Figure 1-11: The VERTICAL and HORIZONTAL Controls

1. Turn the vertical **SCALE** knob a few clicks in first one direction, then the other. Observe the change in the displayed waveform and the channel readout at the bottom of the display.

2. Turn the vertical **POSITION** knob in first one direction, then the other. Observe the change in the displayed waveform. Then return the waveform to the center of the graticule.

   Hint: To make large changes quickly with the position knob, press the **SHIFT** button before turning the knob. When the light above the **SHIFT** button is illuminated and the display says ***Coarse Knobs*** in the upper-right corner, the knob speeds up significantly.

3. Turn the horizontal **SCALE** knob one click clockwise. Observe the time base readout at the bottom of the display. The time base should be set to 200 ns/div now, and you should see two complete waveform cycles on the display.

Example 2: Multiple Waveforms

In this example you learn how to display and control more than one waveform at a time.

1. If you are not continuing from the previous example, follow the instructions on page 1-6 under the heading “Setting Up for the Examples.”
2. Reset the digitizing oscilloscope. (Press **SETUP → Recall Factory Setup** (main) **→ OK Confirm Factory Init** (side).)
3. Press the **AUTOSET** button.

Adding a Waveform

The **VERTICAL** section of the front panel contains the channel selection buttons. On the TDS 820 these are **CH 1**, **CH 2**, and **MORE** (Figure 1-12).

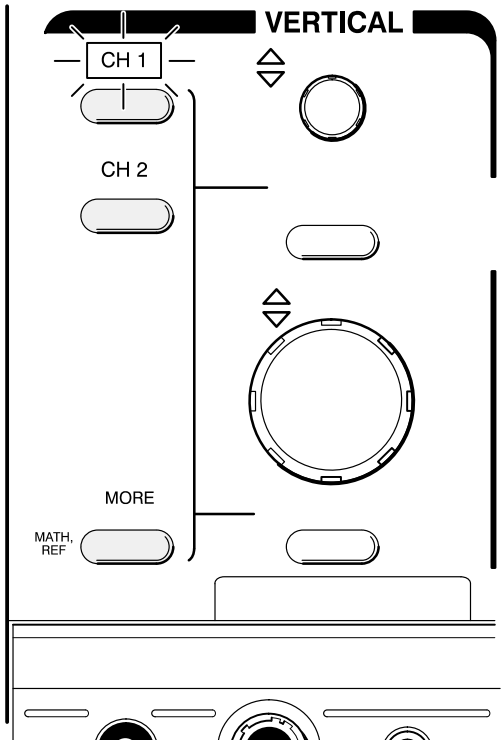


Figure 1-12: The Channel Buttons and Lights

Each of the channel (**CH**) buttons has a light above its label. Right now, the **CH 1** light is on. That indicates that the vertical controls are set to adjust channel 1.

4. Press **CH 2**.

The display shows a second waveform, which represents the signal on channel 2 superimposed on the first waveform.

There are several other important things to observe:

- The channel readout on the display now shows the settings for both **Ch1** and **Ch2**.
- There are two channel indicators at the left edge of the graticule. Right now, they overlap.
- The light next to the **CH 2** button is now on and the **CH 1** light is off. Because the knobs control only one channel at a time, the vertical controls are now set to adjust channel 2.
- The trigger is still detecting trigger events from the external **TRIGGER INPUT**. This has not changed by your adding a channel. (You can change the trigger source by using the **TRIGGER MENU** button to display the trigger menu.)

5. Turn the vertical **POSITION** knob clockwise to move the channel 2 waveform up on the graticule. You will notice that the channel ground reference indicator for channel 2 moves with the waveform.
6. Now press **AUTOSET** again. You will see the two waveforms, channel 2 below channel 1, sized appropriately so that they are both entirely visible on the display. Channel 1 becomes the selected waveform.
7. Press the **VERTICAL MENU** button.

   The **VERTICAL MENU** button displays a menu that gives you control over many vertical channel parameters (Figure 1-13). Although you can display more than one channel, the vertical menu and buttons only adjust the selected channel.

   Each menu item in the Vertical menu displays a side menu. Right now, the **Offset** item in the main menu is highlighted, which means that the side menu shows the vertical offset choices. (Press the **Offset** (main) button if it is not.) At the top of the side menu, the menu title shows the channel affected by the menu choices. It always matches the lighted channel button.

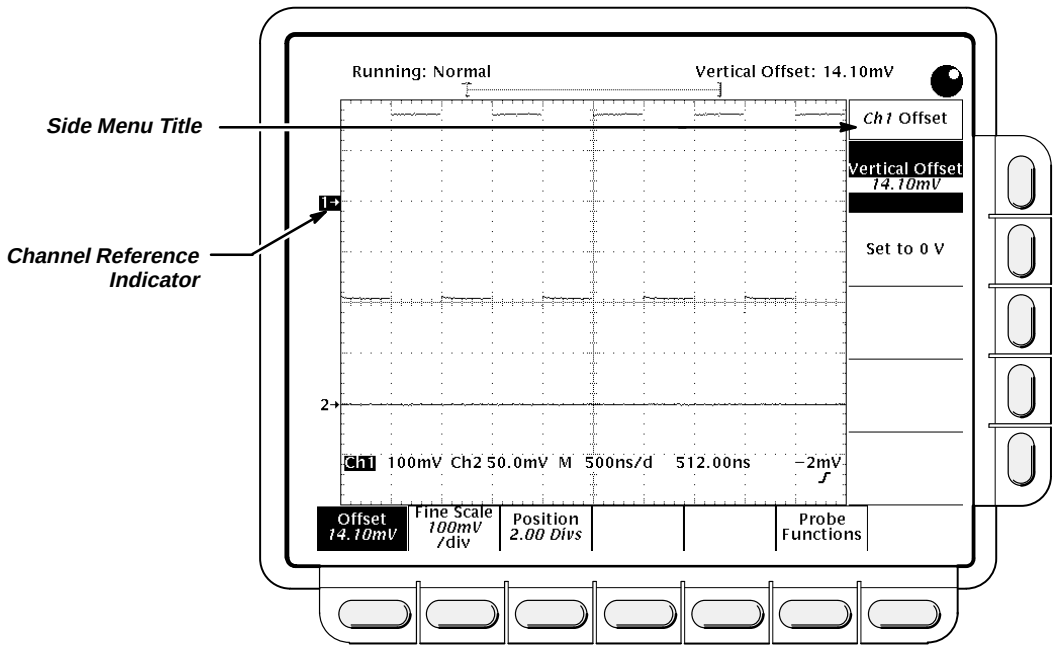


Figure 1-13: The Vertical Main Menu and Offset Side Menu

8. Press the side menu item that sets the vertical offset to 0 V. This changes the vertical offset for channel 1.

Changing Controls to Another Channel

Pressing a channel (**CH**) button sets the vertical controls to that channel. It also adds the channel to the display if that waveform is not already displayed.

1. Press the **CH 2** button in the vertical section of the front panel.

   Observe that now the side menu title shows **Ch2** and that the light above **CH 2** is lighted (Figure 1-14). The highlighted menu item in the side menu has changed from the vertical offset channel 1 setting to the vertical offset setting of channel 2.

   Because channel 2 has no signal, **AUTOSET** may have chosen an inappropriately sensitive vertical scale setting, and you may see random noise. To reduce this random noise, turn the vertical scale knob counterclockwise until channel 2 appears as you would like.

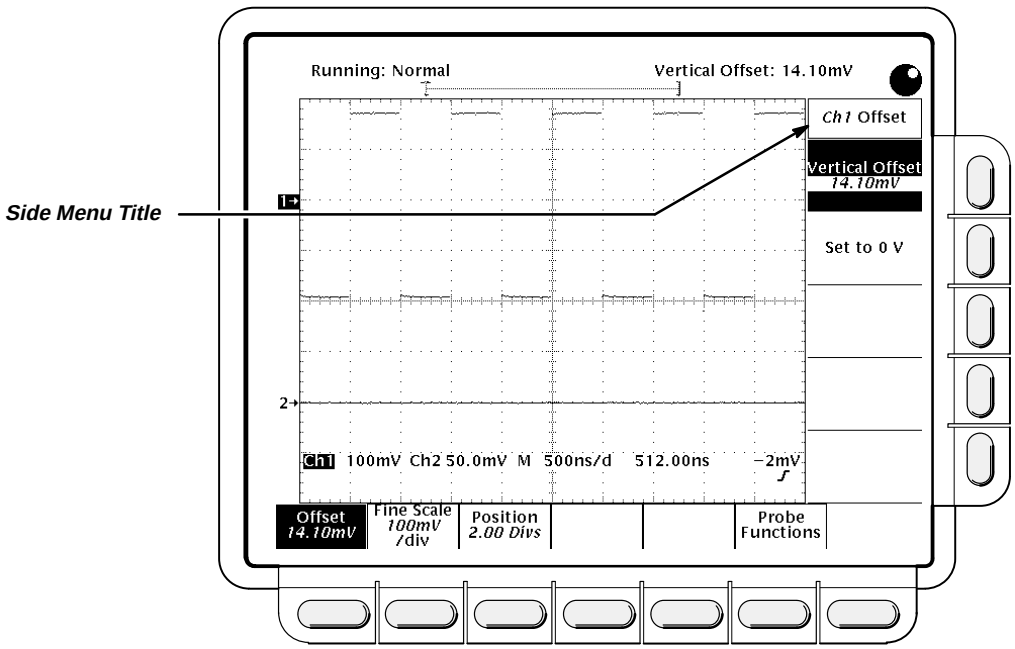


Figure 1-14: The Menus After Changing Channels

2. Press **Fine Scale** (main) to adjust the channel 2 vertical scale.
3. Use the numeric keypad to set the vertical scale to 125 mV per division. Enter **125**, then **SHIFT**, then **m** (the shifted **9** key). Then press **ENTER**.

Removing a Waveform

You use a two-step process to remove waveforms from the display. First, select the channel using the channel (**CH**) button. Second, press the **WAVEFORM OFF** button.

4. Press the **WAVEFORM OFF** button (see Figure 1-15).

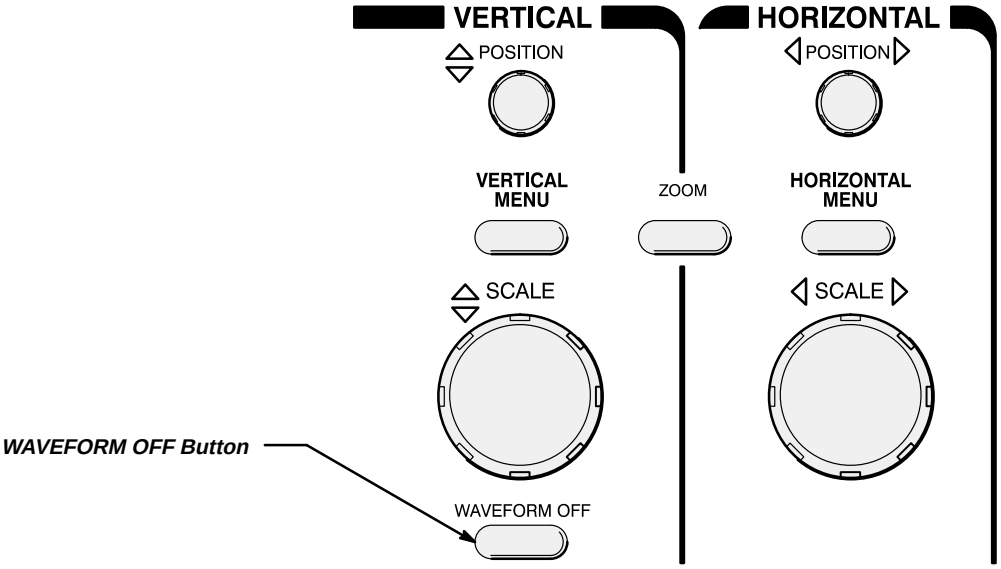


Figure 1-15: WAVEFORM OFF Button Location

Because the **CH 2** light was on when you pressed the **WAVEFORM OFF** button, the oscilloscope removed the channel 2 waveform.

The channel (**CH**) lights now indicate channel 1. Channel 1 has become the selected channel.

5. Press the **WAVEFORM OFF** button again to remove channel 1's waveform.

   When you remove the last waveform, all the **CH** lights turn off.

Example 3: Automated Measurements

In this example you learn how to use the automated measurement system to get numeric readouts of important waveform characteristics.

1. If you are not continuing from the previous example, follow the instructions on page 1-6 under the heading “Setting Up for the Examples.”
2. Reset the digitizing oscilloscope. (Press the **SETUP → Recall Factory Setup** (main) **→ OK Confirm Factory Init** (side).)
3. Press the **AUTOSET** button.

Displaying Automated Measurements

To use the automated measurement system, you must have a stable display of your signal. Also, the waveform must have all the segments necessary for the measurement you want. For example, a rise time measurement requires at least one rising edge and a frequency measurement needs at least one complete cycle.

1. Press **MEASURE** to display the Measure main menu (see Figure 1-16).

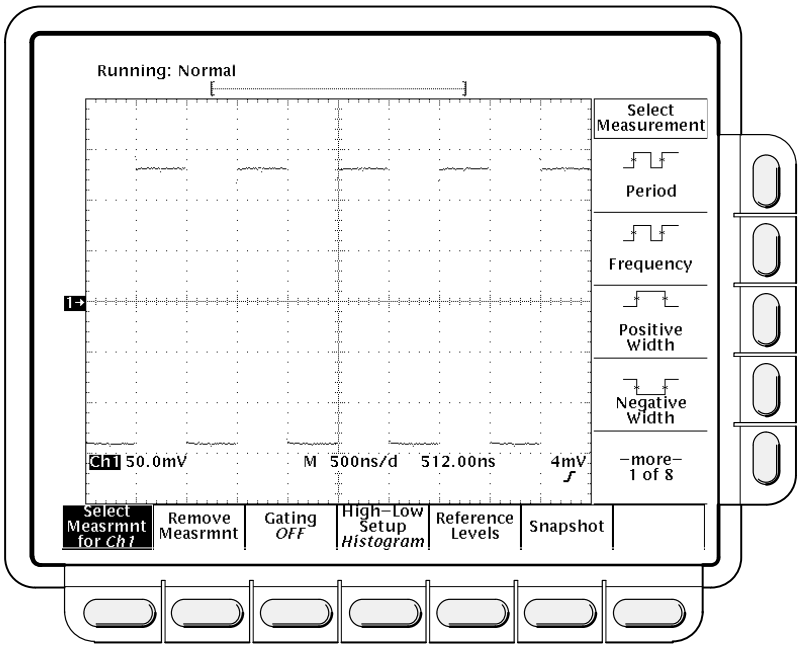


Figure 1-16: Measure Main Menu and Select Measurement Side Menu

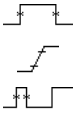
2. If it is not already selected, press **Select Measrmnt** (main). The readout for that menu item indicates which channel the measurement will be taken from. All automated measurements are made on the selected channel.

   The right side of the display shows the Select Measurement side menu. That menu lists some of the possible waveform measurements.

   There are many different measurements available. You can select up to four measurements to be taken and displayed at any one time. Pressing the button next to the **–more–** menu item brings up the other measurement selections.

3. Press **Frequency** (side). If the **Frequency** menu item is not visible, press the **–more–** (side) repeatedly until the **Frequency** item appears. Then press **Frequency** (side).

   Observe that the frequency measurement appears within the right side of the graticule area. The measurement readout includes the notation **Ch1**, meaning that that measurement is taken on the channel 1 waveform. (To take a measurement on another channel, you would select that channel and then select the measurement.)



4. Press **Positive Width** (side) → **–more–** (side) → **Rise time** (side) → **Positive Duty Cycle** (side).

NOTE

If the instrument displays the words "Low Resolution" under the rise time readout, it cannot take enough samples on the leading edge of the waveform to ensure accuracy. Use a faster time per division setting to correct the problem.

   Observe that all four measurements are displayed. Right now, they cover a part of the graticule area, including the displayed waveforms.

5. To move the measurement readouts outside the graticule, press **CLEAR MENU** (Figure 1-17).

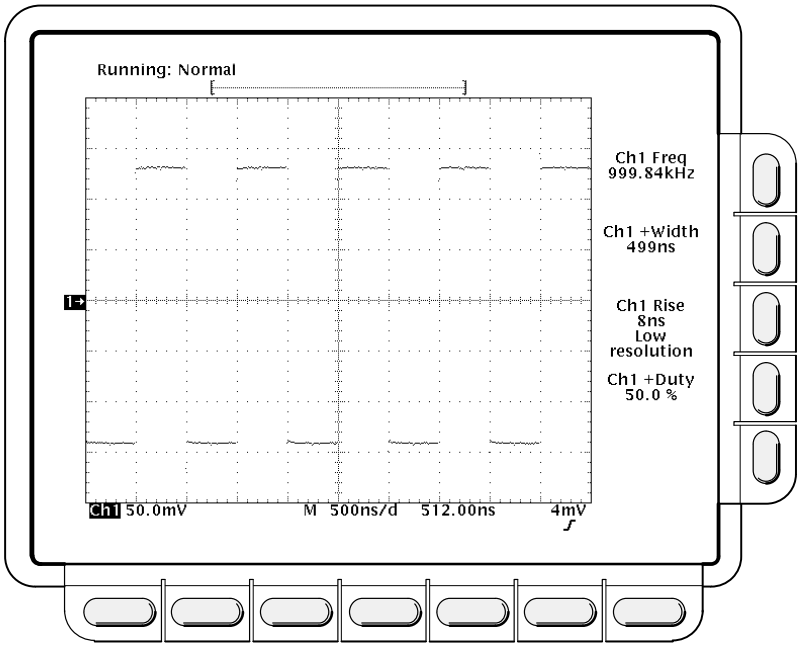


Figure 1-17: Four Simultaneous Measurement Readouts

Removing Measurement Readouts

The Measure menu lets you remove measurements you no longer want displayed. You can remove any one measurement or you can remove them all with a single menu item.

Press **MEASURE → Remove Measrmnt** (main) **→ Measurement 1**, **Measurement 2**, and **Measurement 4** (side) to remove those measurements. Leave the rise time measurement displayed.

Changing the Measurement Reference Levels

By default, the measurement system will use the 10% and 90% levels of the waveform for taking the rise time measurement. You can change these values to other percentages, or change them to absolute voltage levels.

To examine the current values, press the **Reference Levels** (main) **→ High Ref** (side).

The General Purpose Knob

The general purpose knob, the large knob with the indentation, is now set to adjust the high reference level (Figure 1-18).

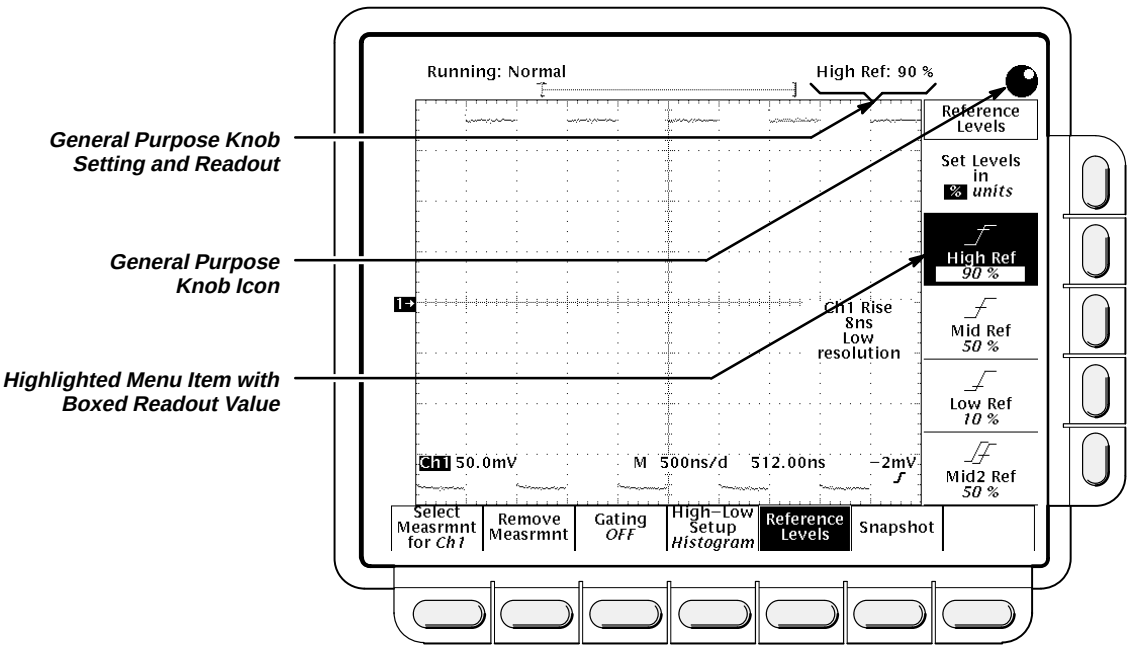


Figure 1-18: General Purpose Knob Indicators

There are several important things to observe on the screen:

- The knob icon appears at the top of the screen. That indicates that the general purpose knob can adjust a parameter.
- The upper right corner of the screen shows the readout **High Ref: 90%**.
- The **High Ref** side menu item is highlighted and a box drawn around the 90% readout in the **High Ref** menu item. The box indicates that the general purpose knob can adjust that parameter.

Turn the general purpose knob left and right, and then use it to adjust the high level to 80%. That sets the high measurement reference to 80%.

Hint: To make large changes quickly with the general purpose knob, press the **SHIFT** button before turning the knob. When the light above the **SHIFT** button is illuminated and the display says ***Coarse Knobs*** in the upper-right corner, the general purpose knob speeds up significantly.

The Numeric Keypad

Any time the general purpose knob can adjust a parameter, instead of using the knob you can enter the value as a number using the keypad. Always end the entry of a number by pressing the **ENTER** (↵) button.

The numeric keypad also provides multipliers for engineering exponents, such as **m** for milli, **M** for mega, and μ for micro. To enter these multiplier values, press the **SHIFT** button, then press the multiplier.

1. Press **Low Ref** (side).

2. On the numeric keypad, press the **2** button, the **0** button, and the **ENTER** (↵) button.

   This step sets the low measurement reference to 20%. Observe that the rise time value has changed.

   Now you want to return the display to its original state.

3. Press **Remove Measrmnt** (main) → **All Measurements** (side).

Example 4: Saving Setups

This example shows you how to save all the settings of the digitizing oscilloscope and how to recall the setup later to quickly reestablish the previously saved state. The oscilloscope provides 10 storage locations where you can save the setups.

Besides being able to save several complete setups, the digitizing oscilloscope saves all the parameter settings when you power off. That feature lets you power on and continue where you stopped without having to reconstruct the state of the digitizing oscilloscope.

1. If you are not continuing from the previous example, follow the instructions on page 1-6 under the heading “Setting Up for the Examples.”
2. Reset the digitizing oscilloscope. (Press **SETUP → Recall Factory Setup** (main) **→ OK Confirm Factory Init** (side).)
3. Press the **AUTOSET** button.

Saving a Setup

In this example you first need to create an instrument setup you want to save. The next several steps establish a display with a measurement on one waveform. That setup is complex enough that you would prefer not to go through all these steps each time you want that display.

1. Press **MEASURE → Select Measrmnt** (main) **→ Frequency** (side). (Press the **–more–** side menu item if the **Frequency** selection does not appear in the side menu.)
2. Press the **CLEAR MENU** button.

Once you have established an instrument setup, you can save it in any of several setup locations.

NOTE

The next step asks you to save a setup in a setup location of your choice. If you work in a laboratory environment where several people share the digitizing oscilloscope, check with the other users to be certain the setup location you are using is not already being used by someone else.

3. Press the **SETUP** button to display the Setup main menu (see Figure 1-19). Press the **Save Current Setup** main menu button.

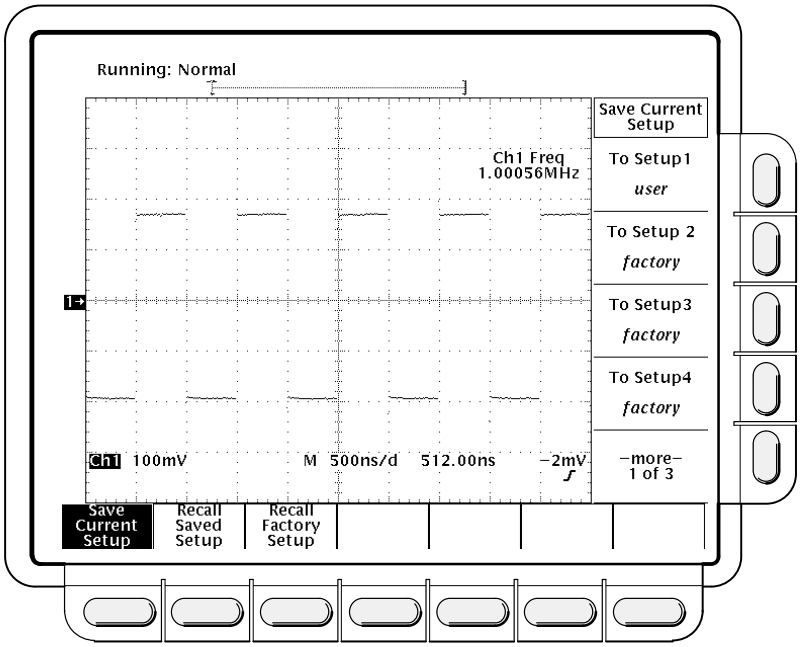


Figure 1-19: Save/Recall Setup Menu

4. To store the current instrument settings into that setup location, press one of the **To Setup** side menu buttons.

   There are more setup locations than can be listed at one time in the side menu. The **–more–** side menu item gives you access to all the setup locations.

   Once you have saved a particular setup, you can change the settings as you wish, knowing that you can come back to that setup at any time.

5. Press the **MEASURE** button to display the Measure main menu. Select the **Positive Width** side menu item to add that measurement to the display.

Recalling a Setup

To recall the setup, press **SETUP → Recall Saved Setup** (main) **→ Recall Setup** (side) for the setup location you used in Step 4. The oscilloscope returns to the setup you saved in Step 4. The positive width measurement is now removed from the display because you selected it after you saved the setup.

This completes the examples. You can restore the default settings by pressing **SETUP → Recall Factory Setup** (main) **→ OK Confirm Factory Init** (side).